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| CAD/CAM CONTROLLED DRAWING |  | 54000-GM11   |  |
| CADD FILE                  |  | 54000-GM11.SHT1  |  |
| 54000-0001                 |  | 54000-0001   |  |
| 1                          |  | IN PARAGRAPHS 2.1.1 AND 3.2.1 UPDATED CLEANING STANDARD FROM SSC STD 79-001 TO RPTSID-8070-0001; IN PARAGRAPH 3.2.1 UPDATED CLEAN LEVEL FROM LEVEL 1XX TO LEVEL 400A; IN PARAGRAPHS 2.2 AND 4.4.1 REPLACED SUPERSEDED ASTM D 3447 WITH ASTM D 6806; IN PARAGRAPH 2.2 UPDATED AMERICAN SOCIETY FOR QUALITY CONTROL TO AMERICAN SOCIETY FOR QUALITY (ASQ). DIRECT DRAWING CHANGE PER SWR RT812PTU00. |  |
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| 1.0   | SCOPE: THIS SPECIFICATION ESTABLISHES THE REQUIREMENTS FOR HYDROCHLOROFLUOROCARBON-(HCF)-225G,1,3-DICHLORO-1,1,2,2,3-PENTAFLUOROPROPANE, HCF-225 CB ISOMER.  |  |
| 1.1   | NOTE: HCF-225 CA AND HCF-225 CB REPRESENT A CONVENTION OF THE AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS, INC. TO DESIGNATE 3,3-DICHLORO-1,1,1,2,2-PENTAFLUOROPROPANE AND 1,3-DICHLORO-1,1,2,2,3-PENTAFLUOROPROPANE, RESPECTIVELY.  | 2.2  |
| 2.0   | APPLICABLE DOCUMENTS: THE FOLLOWING DOCUMENTS FORM A PART OF THIS SPECIFICATION TO THE EXTENT SPECIFIED HEREIN. WHEN THIS DOCUMENT IS USED FOR PROCUREMENT, INCLUDING SOLICITATIONS, OR IS ADDED TO AN EXISTING CONTRACT, THE SPECIFIC REVISION LEVELS, AMENDMENTS, AND APPROVAL DATES OF SAID DOCUMENTS SHALL BE SPECIFIED IN AN ATTACHMENT TO THE SOLICITATION/STATEMENT OF WORK/CONTRACT. | ANSI/ASQ Z1.4<br>SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES.  |
| 2.1   | GOVERNMENTAL SPECIFICATIONS.   |  |
| 2.1.1 | NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)<br>NIST HANDBOOK 44<br>SPECIFICATIONS, TOLERANCES, AND OTHER TECHNICAL REQUIREMENTS FOR WEIGHING AND MEASURING DEVICES   | (APPLICATIONS FOR COPIES SHOULD BE ADDRESSED TO THE AMERICAN SOCIETY FOR QUALITY CONTROL, 611 EAST WISCONSIN AVE. MILWAUKEE, WI 53202-3005.)<br><br>AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)<br>ASTM D 2109<br>STANDARD TEST METHODS FOR NONVOLATILE MATTER IN HALOGENATED ORGANIC SOLVENTS AND THEIR ADMIXTURES.<br>ASTM D 2989<br>STANDARD TEST METHOD FOR ACTIVITY -ALKALINITY OF HALOGENATED ORGANIC SOLVENTS AND THEIR ADMIXTURES.<br>ASTM D 3401<br>STANDARD TEST METHODS FOR WATER IN HALOGENATED ORGANIC SOLVENTS AND THEIR ADMIXTURES.<br>ASTM D 3443<br>STANDARD TEST METHOD FOR CHLORIDE IN TRICHLOROTRIFLUOROETHANE.<br>ASTM D 6806<br>STANDARD PRACTICE FOR ANALYSIS OF HALOGENATED ORGANIC SOLVENTS AND THEIR ADMIXTURES BY GAS CHROMATOGRAPHY. |
| 2.1.2 | OTHER DOCUMENTS.<br>CODE OF FEDERAL REGULATIONS (CFR)<br>29 CFR 1910<br>U.S. DEPARTMENT OF LABOR (OCCUPATIONAL SAFETY AND HEALTH STANDARDS)<br>49 CFR 173<br>U.S. DEPARTMENT OF TRANSPORTATION (SHIPPER'S, GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS)  | 3.0<br>REQUIREMENTS:<br>(APPLICATIONS FOR COPIES SHOULD BE ADDRESSED TO THE AMERICAN SOCIETY FOR TESTING AND MATERIALS, 100 BARR HARBOR DR., WEST CONSHOHOCKEN, PA 19428-2959.)<br>3.1<br>CHEMICAL AND PHYSICAL PROPERTIES: THE SOLVENT SHALL CONFORM TO THE REQUIREMENTS OF TABLE 1 WHEN TESTED AS SPECIFIED IN SECTION 4.0.  |

(APPLICATIONS FOR COPIES OF THE CODE OF FEDERAL REGULATIONS SHOULD BE ADDRESSED TO THE SUPERINTENDENT OF DOCUMENTS, GOVERNMENT PRINTING OFFICE, NORTH CAPITAL AND H STREETS N.W., WASHINGTON, DC 20401.)

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3.2 SHELF LIFE: THE SHELF LIFE IS LIMITED TO FIVE YEARS AFTER THE MANUFACTURE OF THE SOLVENT. AFTER FIVE YEARS, EACH CONTAINER OF SOLVENT SHALL BE TESTED AND CERTIFIED TO THE REQUIREMENTS OF PARAGRAPHS 4.3.1.2 AND 4.3.1.3. IF THE RESULTS OF THE SAMPLINGS ARE ACCEPTABLE THEN THE SOLVENT'S SHELF LIFE CAN BE EXTENDED ANOTHER FIVE YEARS BEFORE RESAMPLING IS REQUIRED. PRIOR TO THE EXPIRATION OF THE SHELF LIFE, ANY NOTICEABLE DEGRADATION OF DISCOLORATION IS CAUSE FOR THE IMMEDIATE DISCONTINUE USE OF THE SOLVENT UNTIL THE SOURCE OF THE DEGRADATION OF DISCOLORATION IS DETERMINED AND CORRECTED AND THE SOLVENT IS RETESTED PER PARAGRAPH 4.3.1.2 AND 4.3.1.3.

3.2.1 CERTIFICATION: PRIOR TO USE ON FLIGHT HARDWARE, FACILITY HARDWARE OR FLIGHT INTERFACE HARDWARE EACH CONTAINER OF SOLVENT SHALL BE SAMPLED FOR NMR AND PARTICULATE. THE RESULTS OF THE SAMPLE ANALYSIS SHALL MEET THE REQUIREMENTS OF NSA RPT TECHNICAL STANDARD RPTSD-8070-0001, LEVEL 400A. IF THE SAMPLE ANALYSIS DOES NOT MEET THE REQUIREMENTS OF RPTSD-8070-0001, LEVEL 400A, THEN THE SOLVENT SHALL BE DISTILLED AND FILTERED AND RETESTED UNTIL THE REQUIREMENTS OF RPTSD-8070-0001, LEVEL 400A ARE MET. CERTIFICATION OF THE SOLVENT IS VALID FOR ONE YEAR. DO NOT USE THE SOLVENT IF NOT CERTIFIED.

3.3 QUALITATIVE: WHEN EXAMINED VISUALLY, THE SOLVENT SHALL BE A HOMOGENEOUS, CLEAR, COLORLESS LIQUID THAT IS FREE OF PARTICULATE MATTER. PARTICULATE VERIFICATION TO BE PERFORMED BY SSC.

#### 4.0 QUALITY ASSURANCE PROVISIONS

4.1 QUALIFICATION AND ACCEPTANCE TESTS: QUALIFICATION AND ACCEPTANCE TESTS SHALL INCLUDE ALL THE TESTS REQUIRED IN THIS SPECIFICATION.

4.2 CERTIFICATION: A CERTIFIED TEST REPORT FROM THE SUPPLIER SHALL ACCOMPANY EACH LOT OF MATERIAL COMPRISING A SHIPMENT STATING THAT THE MATERIAL MEETS ALL THE REQUIREMENTS OF THIS SPECIFICATION. THIS REPORT SHALL INCLUDE THE ACTUAL TEST DATA (E.G. SAMPLE ANALYSIS REPORT AND ACTUAL LABORATORY RESULTS) FOR ALL REQUIREMENTS OF THIS SPECIFICATION.

4.3 RESPONSIBILITY FOR INSPECTION AND TESTING: THE SUPPLIER IS RESPONSIBLE FOR THE PERFORMANCE OF ALL INSPECTIONS AND TESTING SPECIFIED HEREIN. SUPPLIERS MAY, WITH THE APPROVAL OF THE PROCURING AGENCY, USE THEIR OWN FACILITIES OR THOSE OF A COMMERCIAL LABORATORY. THE PROCURING AGENCY RESERVES THE RIGHT TO PERFORM ANY OF THE INSPECTIONS AND TESTING SET FORTH IN THIS SPECIFICATION, WHERE SUCH ARE DEEMED NECESSARY TO ENSURE COMPLIANCE WITH SPECIFICATION REQUIREMENTS.

#### 4.3.1 MATERIAL INSPECTION:

4.3.1.1 INSPECTION LOT: CONTAINERS FILLED IN A 24-HOUR PERIOD FROM THE SAME SOURCE AND WITH THE SAME TYPE OF SOLVENT SHALL BE CONSIDERED AN INSPECTION LOT.

4.3.1.2 SAMPLING: SAMPLING FOR TESTS SHALL BE PERFORMED FROM FILLED CONTAINERS AND SHALL BE IN ACCORDANCE WITH ANSI/ASQ Z1.4.

4.3.1.3 TESTS: SAMPLES SELECTED IN ACCORDANCE WITH 4.3.1.2 SHALL BE TESTED AS SPECIFIED IN 4.4.1 THROUGH 4.4.5. A RESULT OTHER THAN THAT SPECIFIED IN TABLE 1 SHALL CONSTITUTE FAILURE OF THE TEST.

TABLE 1. REQUIREMENTS AND TEST METHODS

| CHEMICAL AND PHYSICAL PROPERTY                                | REQUIREMENT  | TEST METHOD (PARAGRAPH) |
|---|--------------|-------------------------|
| CHEMICAL PURITY, MINIMUM PERCENT.                             | 99.5         | 4.4.1                   |
| ISOMER RATIO, PERCENT   | <2-cq/>98-cb | 4.4.1                   |
| MOISTURE CONTENT, PARTS PER MILLION (PPM), MAXIMUM BY WEIGHT  | 100          | 4.4.2                   |
| ACIDITY (EQUIVALENT HYDROCHLORIC ACID PPM, MAXIMUM BY WEIGHT) | 1.0          | 4.4.3                   |
| FREE CHLORIDE ION, PPM, MAXIMUM BY WEIGHT.                    | 1.0          | 4.4.4                   |
| NONVOLATILE RESIDUE, MAXIMUM PPM BY WEIGHT                    | 10           | 4.4.5                   |

#### 4.4 TEST METHODS:

4.4.1 CHEMICAL PURITY: THE SOLVENT SHALL BE TESTED FOR CHEMICAL PURITY AND ISOMER RATIO IN ACCORDANCE WITH ASTM D 6806 OR AN EQUIVALENT TEST METHOD.

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| 4.4.2 | MOISTURE CONTENT: THE SOLVENT SHALL BE TESTED FOR MOISTURE CONTENT IN ACCORDANCE WITH ASTM D 3401 OR AN EQUIVALENT TEST METHOD.   | 5.3 | CONTAINER INSPECTION AND CLEANING: CONTAINERS SHALL BE CLEANED AS REQUIRED BY THE FILLING CONTRACTOR TO MEET THE REQUIREMENTS LISTED IN TABLE 1. ALL CONTAINER INTERIORS SHALL BE CLEAN AND FREE OF CONTAMINANTS THAT COULD ALTER THE PROPERTIES OF THE FLUID.  |
| 4.4.3 | ACIDITY: THE ACIDITY OF THE SOLVENT SHALL BE DETERMINED IN ACCORDANCE WITH ASTM D 2989 OR AN EQUIVALENT TEST METHOD.  |     |   |
| 4.4.4 | CHLORIDE ION: THE CHLORIDE ION CONTENT OF THE SOLVENT SHALL BE DETERMINED IN ACCORDANCE WITH ASTM D 3443 OR AN EQUIVALENT TEST METHOD.  | 5.4 | FILLING CONTAINERS: UNLESS OTHERWISE SPECIFIED, CONTAINERS SHALL BE FILLED TO THE RATED CAPACITY OF THE CONTAINER LEAVING AT MINIMUM A 3 PERCENT BY VOLUME ULLAGE. THE WEIGHT OF THE SOLVENT SUPPLIED SHALL BE THE DIFFERENCE BETWEEN THE FILLED (GROSS) WEIGHT AND THE UNFILLED (TARE) WEIGHT OF THE CONTAINER. THE SCALE MUST BE CALIBRATED FOR COMMERCE IN ACCORDANCE WITH NIST HANDBOOK 44. |
| 4.4.5 | NONVOLATILE RESIDUE: THE RESIDUE IN THE SOLVENT SHALL BE DETERMINED IN ACCORDANCE WITH ASTM D 2109 OR AN EQUIVALENT TEST METHOD.  |     |   |
| 4.5   | INSPECTION OF PACKAGING: THE PACKAGING OF CONTAINERS OF SOLVENT SHALL BE EXAMINED TO ENSURE THERE IS NO LEAKAGE, CORROSION, OR ANY VISIBLE CONTAMINANTS THAT COULD DEGRADE THE SOLVENT OR CAUSE IT TO BE INADVERTENTLY RELEASED FROM ITS CONTAINER.   | 5.5 | LEAKAGE: CONTAINERS AND VALVES SHALL NOT LEAK AFTER BEING FILLED AND SEALED.  |
| 5.0   | PREPARATION FOR DELIVERY:   | 5.6 | MSDS REQUIREMENTS: MSDS SHEETS SHALL BE SUBMITTED WITH EACH LOT OF SOLVENT.   |
| 5.1   | PACKAGING: THE SOLVENT SHALL BE FURNISHED IN CANS, BOTTLES, PAILS, DRUMS, OR IN LARGER CONTAINERS (E.G., TANKERS, PORTABLE TANKS, OR "TOTES") CONFORMING TO 49 CFR 173 IN ACCORDANCE WITH THE MANUFACTURER'S COMMERCIAL PRACTICE AND THIS SPECIFICATION. PACKAGING SHALL HAVE INTEGRITY CONTROL SEALS INSTALLED ON ALL OUTLETS AFTER FILLING.   | 6.0 | NOTES:  |
| 5.2   | MARKING: EACH CONTAINER OF SOLVENT SHALL INCLUDE THE PROPER WARNING LABELS FOR PERSONNEL SAFETY IN ACCORDANCE WITH 29 CFR 1910. EACH CONTAINER SHALL ALSO BE LEGIBLY AND PERMANENTLY LABELED WITH THE FOLLOWING INFORMATION:<br><br>MATERIAL: SOLVENT, CLEANING<br>SPECIFICATION: 54000-GM11<br>MANUFACTURER'S NAME AND PRODUCT IDENTIFICATION:<br>DATE OF MANUFACTURE:<br>LOT NUMBER:<br>QUANTITY IN THIS CONTAINER:<br>PURCHASE ORDER NUMBER: | 6.1 | INTENDED USE: THE SOLVENT DESCRIBED IN THIS SPECIFICATION IS INTENDED FOR USE AS A PRECISION CLEANING AND VERIFICATION FLUID FOR SPACE FLIGHT HARDWARE AND RELATED GROUND SUPPORT EQUIPMENT, THEIR INTERFACES, AND OTHER SYSTEMS IN WHICH IT MAY BE USED TO CLEAN AND VERIFY.   |
|       |   | 6.2 | HAZARD POTENTIAL: SEE THE MSDS FOR COMPLETE HAZARD, HEALTH, AND REACTIVITY INFORMATION. THE NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS FOLLOW:<br>A. FIRE 0<br>B. HEALTH 2<br>C. REACTIVITY 0  |
|       |   | 6.3 | ACQUISITION REQUIREMENTS: ACQUISITION DOCUMENTS SHALL SPECIFY THE FOLLOWING:<br>A. TITLE, NUMBER, AND DATE OF SPECIFICATION<br>B. METHOD OF SHIPMENT AND THE TYPE AND CAPACITY OF CONTAINERS.<br>C. QUANTITY BY WEIGHT<br>D. WHEN A DIFFERENT SAMPLING PLAN IS REQUIRED (SEE 4.3.1.2)<br>E. PACKAGING REQUIREMENTS (SEE SECTION 5.0)  |

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